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54 **A laterally swinging hinge device.**

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**EP-A- 0 066 473**  
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**FR-A- 569 262**  
**FR-A- 670 904**

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## Description

This invention relates to a laterally swinging hinge assembly.

The hinge has been an indispensable item in daily life; for instance, all doors (such as an ordinary door or an automobile door) are always mounted with a hinge or hinges. The conventional hinge usually comprises two hinge butts, and the cylinders of the butts are assembled together along a straight line around a center shaft. The hinge butts can be turned at an angle of typically 315°; the frictionally engaging parts of the conventional hinge are the center shaft and the inner walls of the cylinders. This sliding friction results in noise and wear.

The conventional hinge has no lateral play; for instance, two hinges to be mounted on a door have to be installed and aligned along a straight line exactly and no straight line tolerance is allowed otherwise, the two hinges will experience considerable friction and generate noise. As a result, the serviceable life of the hinges can be shortened, as can the serviceable life of the door. When an automobile door is mounted with conventional hinges, the center lines of the hinges have to be aligned carefully and repeatedly otherwise after a period of time, the hinges would be noisy. In the case of a door to be mounted with three or more hinges, the alignment of the center line therefore is rather difficult.

The top cap of a conventional hinge is usually fixed together with the center shaft, which will be put through the cylinders of two hinge butts, and then a bottom cap is screwed under the center shaft for decorative purposes. Generally, it is not easy to distinguish which is the top cap and which is the bottom cap. In some cases, the center shaft can drop after a period of time as a result of long term wear and tear and the effect of gravity and a degree of inconvenience may result.

EP-A-66,473 discloses a laterally swinging hinge assembly comprising two hinge butts, one of said hinge butts carrying a shaft which extends longitudinally through a tubular cylinder portion carried on the other of said hinge butts, said cylinder portion having a flange on an inner wall thereof and a threaded sleeve screwed into a threaded portion of said inner wall, said shaft comprising a ball portion at its mid-portion which is supported between two rod portions extending longitudinally away from said ball portion and is located between said flange and said threaded sleeve, there being a clearance around said rod portions to allow lateral swinging of said shaft.

An object of the present invention is to reduce the friction in a hinge assembly.

Accordingly, the present invention provides a

laterally swinging hinge assembly as disclosed in EP-A-66,473, characterised in that a first steel ball assembly is located by said threaded sleeve against said ball portion and a second steel ball assembly is located by said flange against said ball portion to ensure rolling friction whether the hinge assembly swings about a longitudinal axis, or laterally.

Two embodiments of this invention are described below by way of example, with reference to the drawings in which:

FIG. 1 is a perspective and disassembled view of embodiment-I of the present invention.

Fig. 2 is a longitudinal sectional view of embodiment-I of the present invention.

FIG. 3 is a perspective view of embodiment I of the present invention.

FIG. 4 illustrate a laterally turning view of embodiment-I of the present invention.

FIG. 5 illustrates the laterally turning view in the opposite sense of embodiment-I of the present invention.

FIG. 6 illustrates a further laterally turning view of embodiment-I of the present invention.

FIG. 7 illustrates a laterally inclining view in the opposite sense of embodiment-I of the present invention.

FIG. 8 is a perspective view of embodiment-II of the present invention.

FIG. 9 is a longitudinal sectional view of embodiment-II of the present invention.

FIG.10 is a disassembled view of embodiment-II of the present invention.

FIG. 1 illustrates a disassembled view of embodiment-I of the present invention, which comprises a hinge butt assembly having a left and right butt, a cylinder assembly having three parts, i.e. a mid-cylinder 3 attached to the left butt 1, an upper and a lower cylinders 4 and 5 attached to the right butt 2. The length of the mid-cylinder 3 is equal to the sum of the length of the upper and lower cylinders 4 and 5 so as to balance the force exerted thereon. The two ends of the mid-cylinder 3 have a curved shape and the periphery of the mid-cylinder is barrel-shaped. The diameter of the mid-cylinder 3 is slightly larger than those of the upper and lower cylinders 4 and 5. The inner wall of the upper cylinder 4 is furnished with female threads 9 so as to fit with the top lid 6. The top inner wall of the lower cylinder 5 is also furnished with female threads 10 so as to fit with the male threads 11 on the lower rod 8 of the center shaft 7 for fixing the center shaft 7 in place. The mid portion of the center shaft 7 is a ball 12. The upper rod 13 has a shoulder 14, and has made threads 15 on the top portion. Two steel ball assemblies 16 and 17 are mounted closely to the both ends of the ball 12 so as to form a rolling friction device. The

steel ball socket 18, the pad 33 and threaded sleeve 34 are used for limiting the upper ball assembly 16 to roll within a given space. The pad 33 has two lugs to be fitted in the channel 37 inside the mid-cylinder 3 so as to prevent the pad 33 from rotating. The threaded sleeve 34 can be used for a long time without becoming loose. The shaft sleeve 19 is mounted on the shoulder 14 of the upper rod 13 of the center shaft 7; by means of the outer threads, the shaft sleeve 19 can be engaged with the female threads 9 in the upper cylinder 4 to fall on the shoulder 14. A hexagonal nut 20 is mounted on the threads 15 of the upper rod 13. The top end of the upper cylinder 4 is capped with a top cap 6, while the lower end of the lower cylinder 5 is capped with a bottom cap 21 for decorative purpose. Both of the lids are hexagonal.

FIG. 2 illustrates a longitudinal sectional view of embodiment-I of the present invention in which the left butt 1 and the right butt 2 are assembled together; the upper, mid and lower cylinders are assembled in alignment with one another; the mid cylinder 3 is connected together with the left butt 1, while the upper and lower cylinders 4 and 5 are connected with the right butt 2. The central part of the mid cylinder is mounted with a central shaft 7. The inner wall of the mid cylinder 3 is furnished with a flange 22 for holding the lower steel ball assembly 17 in a given space therein so as to provide a bearing function for the center shaft 7, the ball 12 and the mid cylinder 3. The upper inner wall of the mid cylinder 3 is furnished with female threads for mounting a threaded sleeve 34, a steel ball socket 18, and a pad 33. The sleeve 34 is used for holding the upper steel ball assembly 16 against the upper surface of the ball 12 of the center shaft 7. Upon the two butts being moved, the cylinder and the center shaft 7 have no direct friction surface; instead, the ball 12 of the center shaft 7 and the mid cylinder 3 are in rolling contact. The top of the lower cylinder 5 is a concave surface. The inner wall of the lower cylinder 5 is furnished with female threads 10 to mate with the male threads 11 on the lower rod 8 of the center rod 7 so as to fix the center shaft 7 in place. The lower end of the lower cylinder 5 is capped with a bottom cap 21 for decorative purpose. The inner wall of the upper cylinder 4 is furnished with female threads 9, of which the diameter is larger than that of the upper portion of the mid cylinder 3 so as to facilitate the insertion of steel ball socket 18 and the pad of washer 33. The threaded sleeve 34 can be dropped through the upper cylinder to the mid-cylinder 3. without slowly screwing through. A shaft sleeve 19 is mounted in the upper cylinder 4 with its center hole being mounted on the center shaft 7. The bottom of the shaft sleeve 19 is closely mounted on the shoulder 14 so as to fix the

center shaft 7 in place; then, a hexagonal nut 20 is locked above the shaft sleeve. A top cap 6 is finally mounted on the top of the upper cylinder for decorative purpose. In order to let the hinge device have a laterally swinging space, the inner side 23 portions of left butt 1 have a slanting angle of about  $5^\circ$ ; further, the inner wall 24 of the steel ball socket 18 and the threaded sleeve 34, and the flange 22 of the mid cylinder 3 will also have a slanting angle of about  $5^\circ$  in relation to the center shaft 7.

FIG.3 illustrates a perspective view of embodiment-I of the present invention, in which both the top cap 6 and the bottom cap 21 are mounted in place for decorative purpose. Both the left and right butts 1 and 2 are furnished with several screw holes 25 so as to fix the hinge butts with screws to a door or a movable lid and support thereof.

FIG.4,5,6, and 7 illustrate embodiment-I of invention set at various lateral orientations. The conventional hinge only has a longitudinal movement at an angle of  $315^\circ$  without having any lateral play. The hinge according to embodiment-I has at least  $5^\circ$  play laterally about both axes and can therefore eliminate the difficulty in rotation in the case that the hinge axes of more than one hinge do not coincide.

FIG.8 is perspective view of embodiment-II according to the present invention, which is for use with an automobile door. The left butt 31 is welded to the cylinder 32, of which the length is slightly larger than the height of the left butt. Both ends of the right butt 46 are formed into two round flat pieces with two round holes 34 respectively. The right butt 46 is directly mounted on a center shaft 35, which is substantially a hollow cylinder. A pin 36 is mounted inside the center shaft 35; one end of the pin 36 is formed into a semi-spherical shape; after the other end of the pin 36 passing through the round holes 34 of the right butt 46, that end will be riveted on the right butt 46. The shape of the two butts may be varied in accordance with different models of car.

FIG.9 is a longitudinal sectional view of embodiment-II according to the present invention, in which the inner wall of the cylinder 32 is furnished with a flange 37, and the center shaft 35 is a round tube with a ball 38 in the mid-portion thereof; the center shaft 35 includes an upper rod 39 and a lower rod 40; the assembling method of the two sets of ball assemblies 41 and 42, the steel ball socket 43. The pad 44 and the threaded sleeve 45 are the same as those of embodiment-I. The pin 36 is inserted through the left and right butts 31 and 32, and the center shaft 35; then the lower end of the pin 36 is riveted so as to have the pin closely fitted in the two holes 34 of the right butt 46, and to let the two butts during lateral motion

have rolling friction between the ball 38 of the center shaft 35, the steel ball assemblies, and the cylinder. In fact, the inner wall of the cylinder 32, the steel ball socket 43 and threaded sleeve 45 are the same as those in the embodiment-I; the inner wall of the cylinder has at least 5° of slanting angle so as to furnish a lateral play of at least 5°.

FIG.10 is a disassembled view of embodiment-II of the present invention, in which the left butt 31 is welded together with the cylinder 32. The cylinder 32 is then mounted with lower steel ball assembly 42, the center shaft 35, the upper steel ball assembly 41, the steel ball socket 43, and the pad 44. The pad or washer 44 has two symmetrical lugs to be mated with the channel 46 inside the cylinder 32 so as to prevent the pad 44 from rotating. Furthermore, the threaded sleeve 45 is engaged with the female threads in the cylinder 32. The two holes 34 on the right butt 46 align with the through hollow center portion of the center shaft 35; finally, the ends of the pin 36 are rivetted closely against the round holes 34 of the right butt 33, and the whole hinge device is assembled completely.

The present invention can be used on an ordinary door or an automobile door, i.e. one butt of the hinge is mounted on the movable part, while the other butt is mounted on the fixed part of the door. Since the hinge according to preferred embodiments of the present invention has 5° play to either lateral direction, any door may be installed with two or more than two hinges according to the present invention without impairing the normal operation of the door in the case that the center lines of the hinges are not aligned exactly on one straight line (which in fact, is impossible). Furthermore, since the moving parts of the hinge of the present invention have a rolling motion, the friction between them can be reduced to a minimum.

### Claims

1. A laterally swinging hinge assembly comprising two hinge butts (1,2;31,46), one (2;46) of said hinge butts carrying a shaft (7;35) which extends longitudinally through a tubular cylinder portion (3;32) carried on the other (1;31) of said hinge butts, said cylinder portion having a flange (22;37) on an inner wall thereof and a threaded sleeve (34;45) screwed into a threaded portion of said inner wall, said shaft comprising a ball portion (12;38) at its mid-portion which is supported between two rod portions (13,8;39,40) extending longitudinally away from said ball portion and is located between said flange and said threaded sleeve there being a clearance around said rod portions to allow lateral swinging of said shaft,

characterised in that a first steel ball assembly (16;41) is located by said threaded sleeve (34;45) against said ball portion (12;38) and a second steel ball assembly (17;42) is located by said flange (22;37) against said ball portion to ensure rolling friction whether the hinge assembly swings about a longitudinal axis, or laterally.

2. A laterally swinging hinge assembly according to claim 1, wherein said clearance is sufficient to allow relative lateral swinging through an angle of at least 5°.
3. A laterally swinging hinge assembly according to claim 1 or claim 2, wherein at least one portion of said inner wall surrounding a said rod portion (13,8;39,40) is frusto-conical, such that said clearance increases in the longitudinal direction away from said ball portion (12;38).
4. A laterally swinging hinge assembly according to any preceding claim wherein said one hinge butt (2) carries two further tubular cylinder portions (4,5) which are aligned with said tubular cylinder portion (3) of said other hinge butt (1) at each end thereof and said rod portions (13,8) are threadedly engaged in respective ones of said further tubular cylinder portions.
5. A laterally swinging hinge assembly according to claim 4, wherein said tubular cylinder portion (3) of said other hinge butt (1) has a barrel-shaped exterior and is partially located within a cut-out of complementary shape in a plate of said one hinge butt (2).
6. A laterally swinging hinge assembly according to any preceding claim, wherein a further sleeve (18;43) is urged by said threaded sleeve (34;45) against said first steel ball assembly (16;41) within said tubular cylinder portion (3;32) of said other hinge butt (1;31) and washer means (33/44) are provided for preventing rotation of said further sleeve.
7. A laterally swinging hinge assembly according to any of claims 1 to 3 or claim 5 or claim 6 as dependent on any of claims 1 to 3, wherein said shaft (35) is tubular and is mounted on a pin (36) which extends through said tubular shaft, the ends of said pin being riveted to lug portions of said one hinge butt (33).

### Revendications

1. Charnière à débattement latéral comprenant

- deux paumelles (1, 2 ; 31, 46), l'une (2 ; 46) de ces paumelles portant un axe (7 ; 35) passant longitudinalement dans un cylindre tubulaire (2 ; 32) portée par l'autre (1 ; 31) des paumelles, ce cylindre comportant un rebord (22 ; 37) sur une paroi intérieure de celle-ci; et un manchon fileté (34 ; 35) se vissant dans une partie filetée de la paroi intérieure, l'axe comprenant, au milieu de celui-ci, une boule (12 ; 38) montée entre deux tiges (13, 8 ; 39, 40) partant longitudinalement de la boule et cette boule se plaçant entre le rebord et le manchon fileté, tandis qu'un certain espace libre est ménagé autour des tiges pour permettre le débattement latéral de l'axe, charnière à débattement latéral caractérisée en ce qu'un premier ensemble de billes d'acier (16 ; 41) est placé par le manchon fileté (34 ; 45) contre la boule (12 ; 38) et en ce qu'un second ensemble de billes d'acier (17 ; 42) est placé par le rebord (22 ; 37) contre la boule, de manière à assurer une friction de roulement aussi bien lorsque la charnière bascule autour de son axe longitudinal que lorsqu'elle bascule latéralement.
2. Charnière à débattement latéral selon la revendication 1, caractérisée en ce que l'espace libre de jeu est suffisant pour permettre un débattement latéral relatif d'un angle d'au moins 5°.
3. Charnière à débattement latéral selon l'une quelconque des revendications 1 et 2, caractérisée en ce qu'une partie au moins de la paroi intérieure entourant la tige (13, 8 ; 39, 40) est de forme tronconique, de façon que l'espace libre de jeu augmente dans la direction longitudinale s'écartant de la boule (12 ; 38).
4. Charnière à débattement latéral selon l'une quelconque des revendications précédentes, caractérisée en ce qu'une paumelle (2) porte deux parties cylindriques tubulaires supplémentaires (4, 5) alignées avec la partie cylindrique tubulaire (3) de l'autre paumelle (1) à chaque extrémité de celle-ci, et en ce que les tiges (13, 8) se vissent dans ces parties cylindriques tubulaires supplémentaires respectives.
5. Charnière à débattement latéral selon la revendication 4, caractérisée en ce que la partie de cylindre tubulaire (3) de l'autre paumelle (1) présente une surface extérieure en forme de tonneau et se loge partiellement à l'intérieur d'une découpe de forme complémentaire d'une plaque de la première paumelle (2).

6. Charnière à débattement latéral selon l'une quelconque des revendications précédentes, caractérisée en ce qu'un manchon supplémentaire (18 ; 43) est poussé par le manchon fileté (34 ; 45) contre le premier ensemble de billes d'acier (16 ; 41) à l'intérieur de la partie de cylindre tubulaire (3 ; 32) de l'autre paumelle (1 ; 31), et en ce que des moyens de rondelle (33/44) sont utilisés pour empêcher la rotation de ce manchon supplémentaire.
7. Charnière à débattement latéral selon l'une quelconque des revendications 1 à 3 ou selon la revendication 5 ou la revendication 6 dépendant de l'une quelconque des revendications 1 à 3, caractérisée en ce que l'axe (35) est tubulaire et se monte sur une goupille (36) traversant cet axe tubulaire, les extrémités de cette goupille étant rivetées à des parties d'ergots de la première paumelle (33).

#### Patentansprüche

1. Scharnier mit seitlicher Bewegungsmöglichkeit, mit zwei Scharnierlaschen (1, 2; 31, 46), von denen eine (2; 46) eine Welle (7; 35) trägt, die sich in Längsrichtung in einem röhrenförmigen Zylinder (3, 32) erstreckt, der von der zweiten Scharnierlasche (1; 31) getragen wird, wobei der Zylinder einen Flansch (22; 37) auf seiner Innenwand und eine Gewindehülse (34; 45) aufweist, die in ein Gewinde der Innenwand eingeschraubt ist, und die Welle eine mittig angeordnete Kugel aufweist, die von zwei Rundstäben (13, 8; 39, 40) getragen wird, die sich in Längsrichtung von der Kugel weg erstrecken, und die zwischen dem Flansch und der Gewindehülse derart angeordnet ist, daß um die Rundstäbe ein Freiraum besteht, der es der Welle erlaubt, seitlich verschwenkt zu werden, **dadurch gekennzeichnet**, daß ein erstes Kugellager (16; 41) mittels der Gewindehülse (34, 45) gegen die Kugel (12; 38) anliegt und ein zweites Kugellager (17; 42) mittels des Flansches (22; 37) gegen die Kugel anliegt, um eine Rollreibung beim Verschwenken des Scharniers um die Längsachse oder beim seitlichen Verschwenken zu gewährleisten.
2. Scharnier mit seitlicher Bewegungsmöglichkeit nach Anspruch 1, **dadurch gekennzeichnet**, daß der Freiraum so groß ist, daß er ein relatives seitliches Verschwenken innerhalb eines Winkels von mindestens 5° ermöglicht.
3. Scharnier mit seitlicher Bewegungsmöglichkeit nach Anspruch 1 oder 2, **dadurch gekennzeichnet**, daß mindestens ein Bereich der In-

nenwand, die die Rundstäbe (13, 8; 39, 40) umgibt, kegelstumpfförmig ausgebildet ist, so daß der Freiraum in Längsrichtung von der Kugel größer wird.

- 5
4. Scharnier mit seitlicher Bewegungsmöglichkeit nach einem der vorstehenden Ansprüche, **dadurch gekennzeichnet**, daß eine Scharnierlasche (2) zwei weitere zylinderförmige Teile (4, 5) trägt, die an den Zylinder (3) der anderen Scharnierlasche (1) an jedem seiner Enden anschließen und daß die Rundstäbe (13, 8) in die jeweiligen Enden der zylinderförmigen Teile (4, 5) mittels eines Gewindes eingreifen.
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5. Scharnier mit seitlicher Bewegungsmöglichkeit nach Anspruch 4, **dadurch gekennzeichnet**, daß der röhrenförmige Zylinder (3) der Scharnierlasche (1) eine tonnenförmige Gestalt aufweist und teilweise in einem Freischnitt der Scharnierlasche (2) von entsprechender Form angeordnet ist.
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6. Scharnier mit seitlicher Bewegungsmöglichkeit nach einem der vorstehenden Ansprüche, **dadurch gekennzeichnet**, daß eine weitere Hülse (18; 43) durch die Gewindehülse (34; 45) gegen das erste Kugellager (16; 41) innerhalb des röhrenförmigen Zylinders (3; 32) der Scharnierlasche (1; 31) gedrückt wird und daß eine Sicherungsscheibe vorgesehen ist, die ein Verdrehen der weiteren Hülse verhindert.
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- 35
7. Scharnier mit seitlicher Bewegungsmöglichkeit nach einem der Ansprüche 1 bis 3, 5 oder 6, **dadurch gekennzeichnet**, daß die Welle (35) röhrenförmig ausgebildet und auf einem Stab (36) montiert ist, der sich durch die röhrenförmige Welle erstreckt, wobei die Enden des Stabes an Halteösen der Scharnierlasche (33) angeietet sind.
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- 45
- 50
- 55

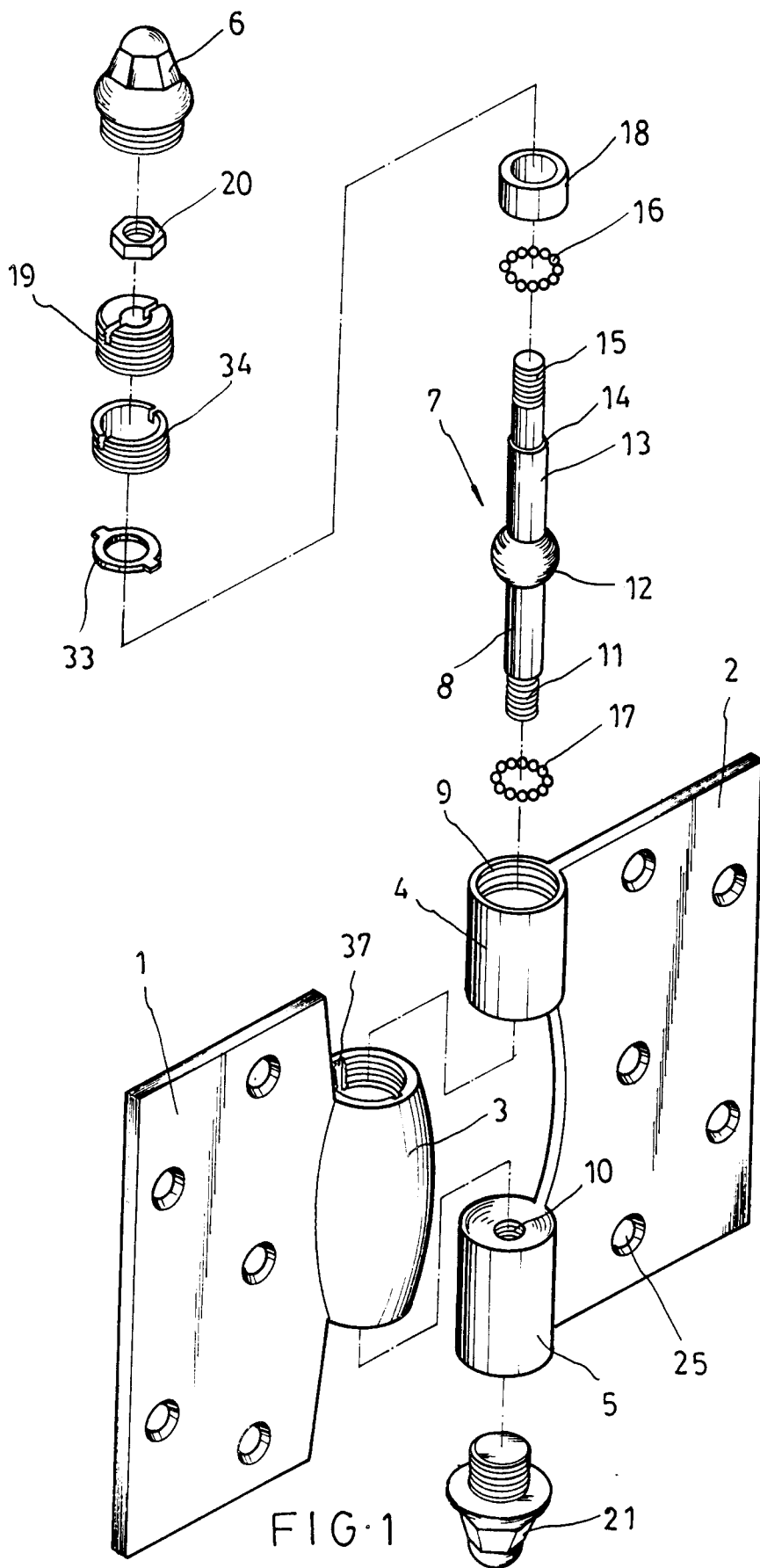
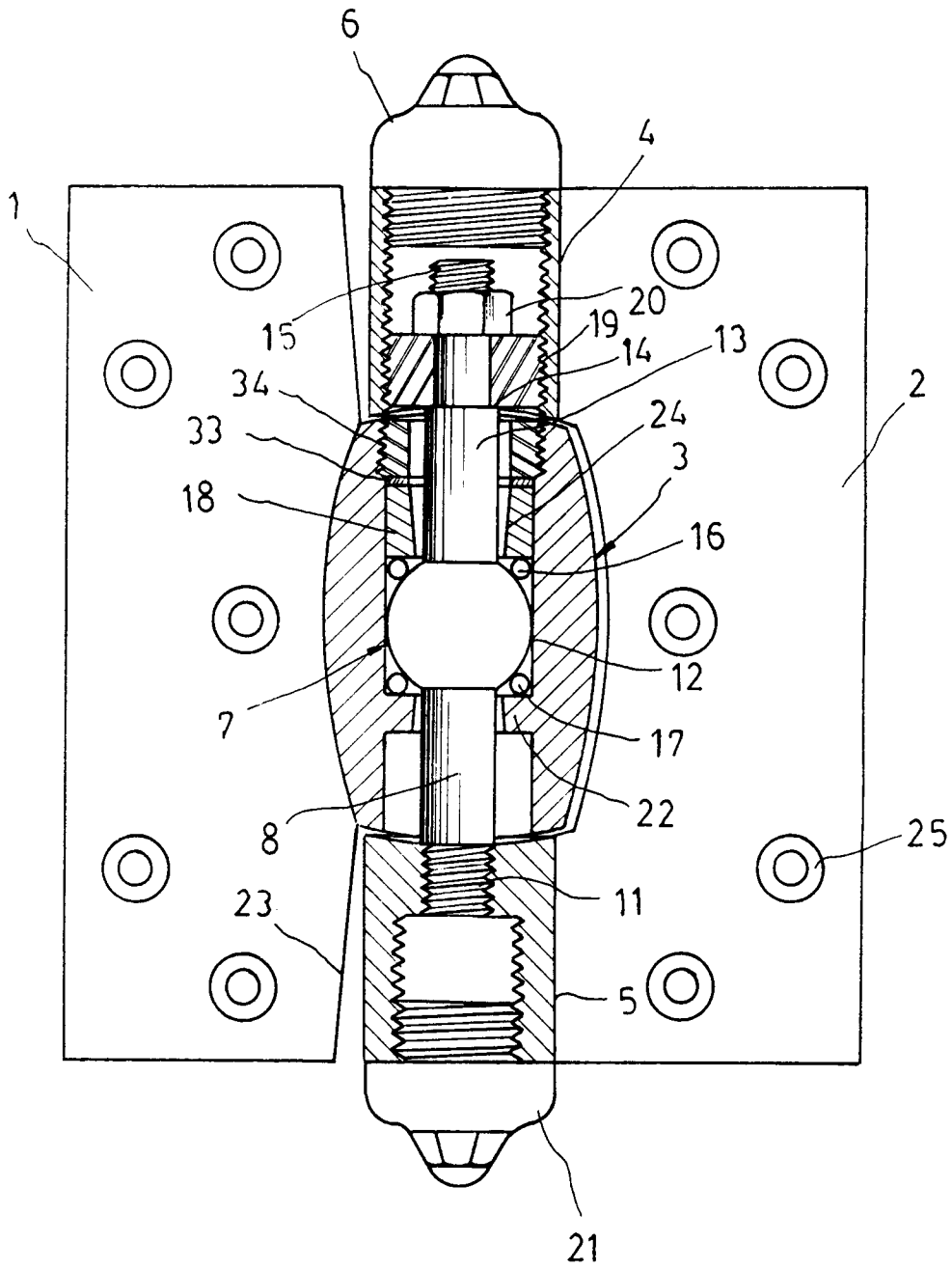


FIG. 1





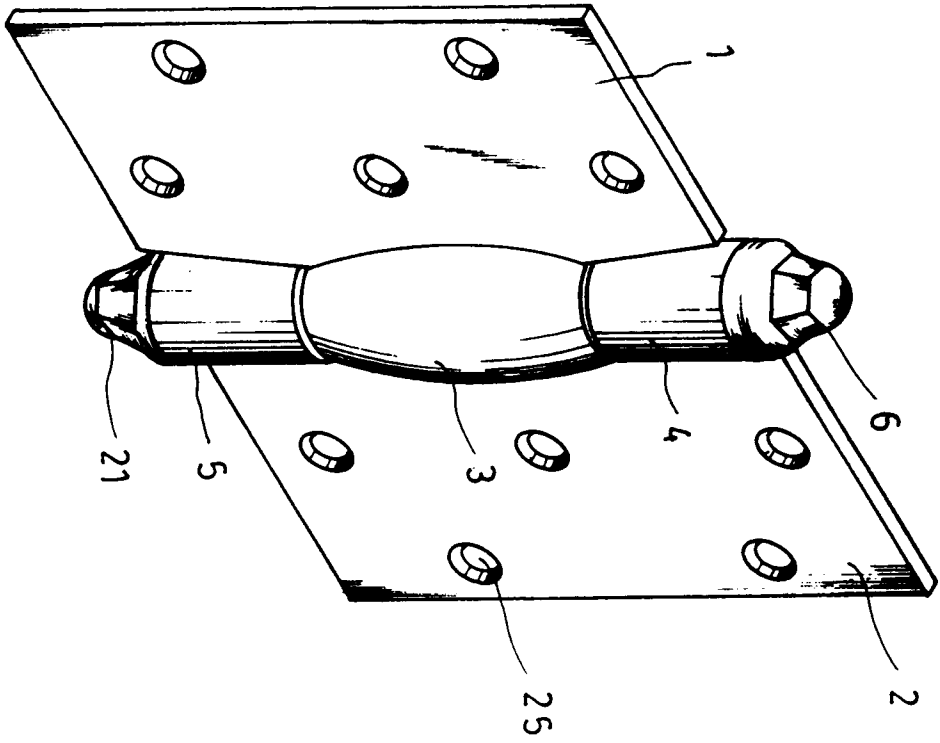


FIG. 3

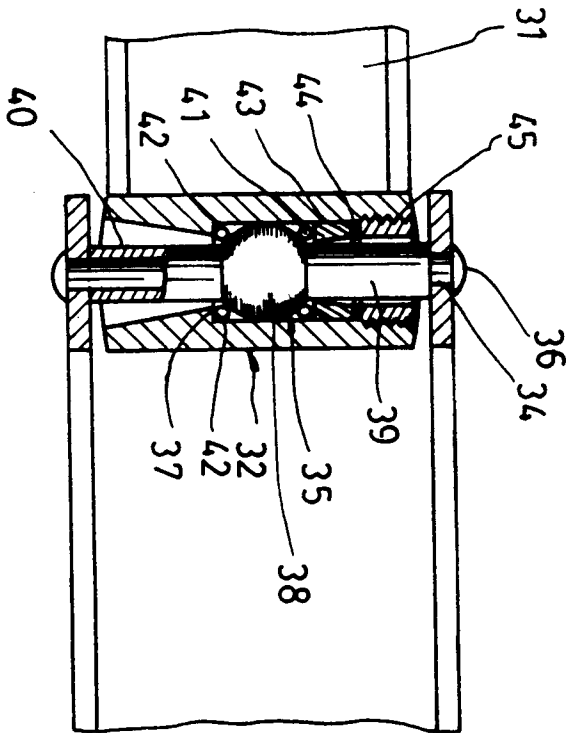


FIG. 9

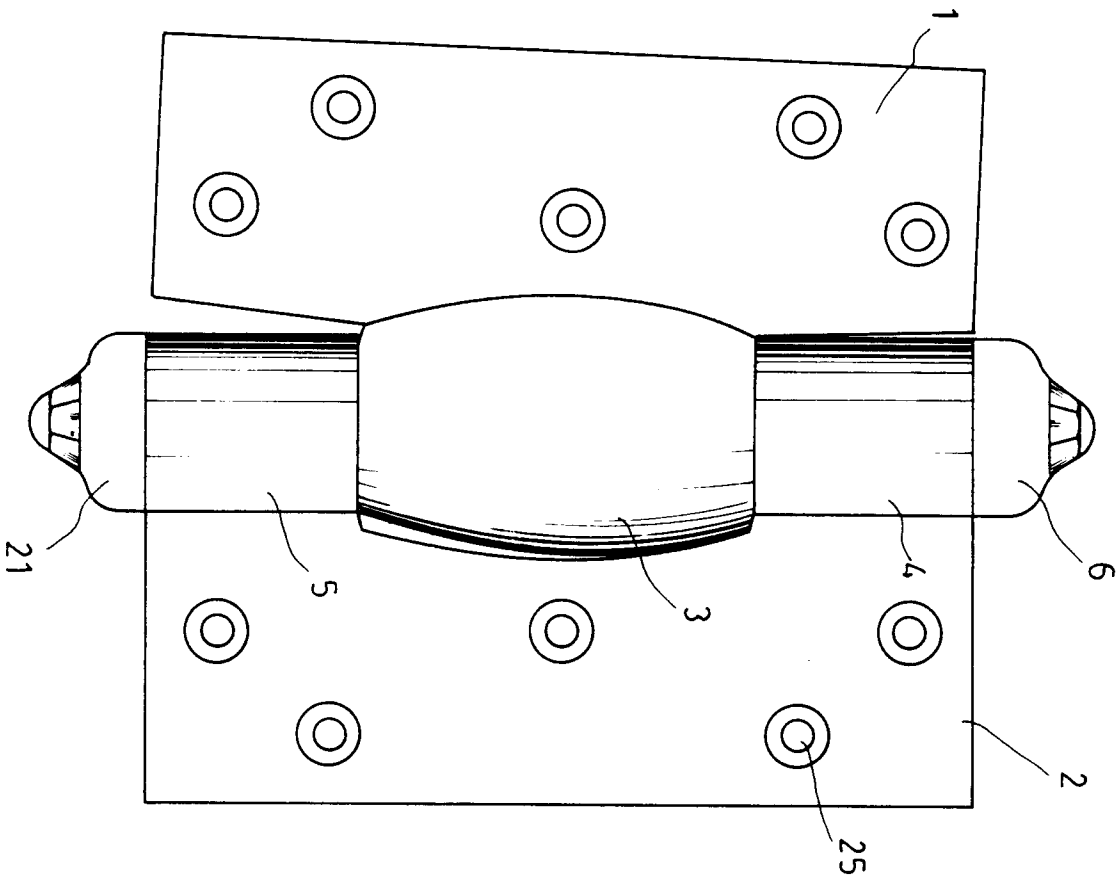


FIG. 4

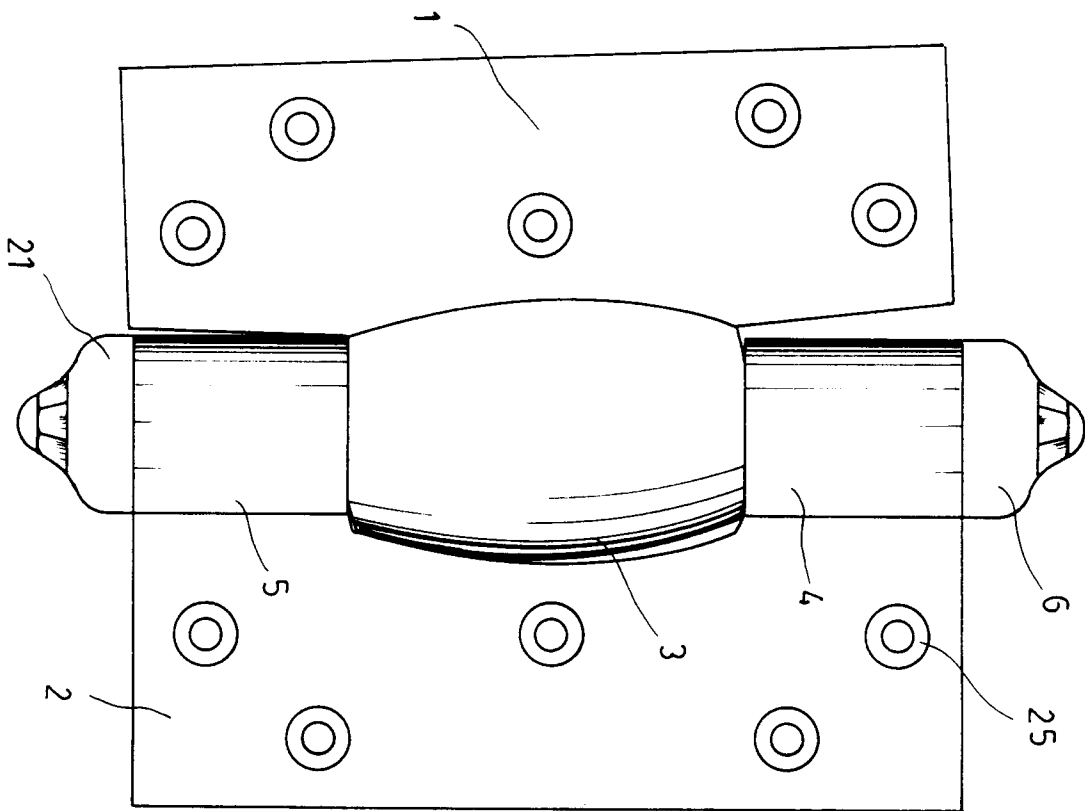
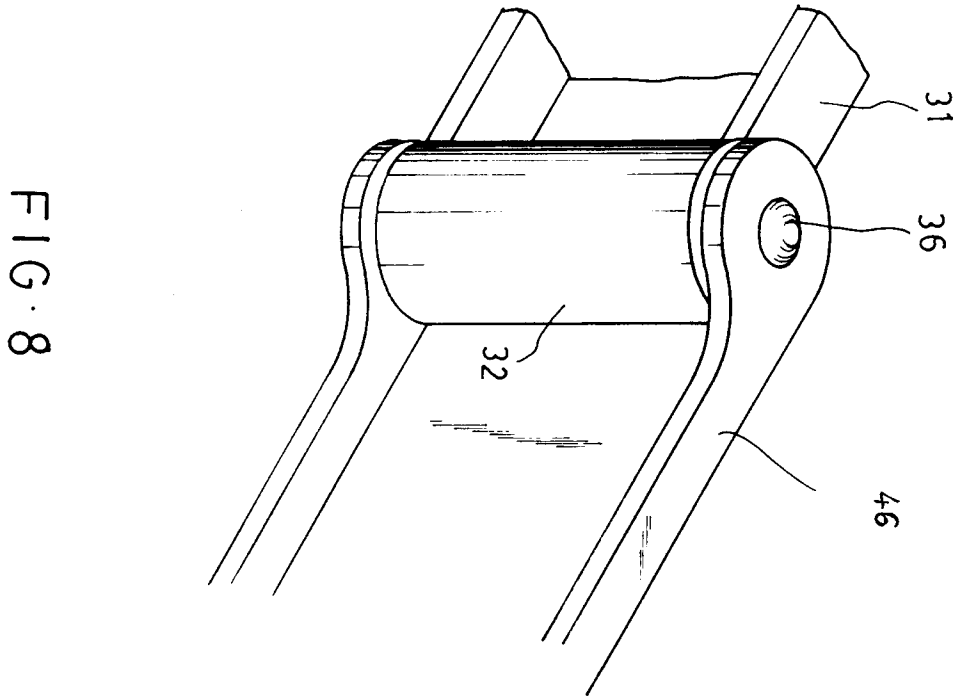
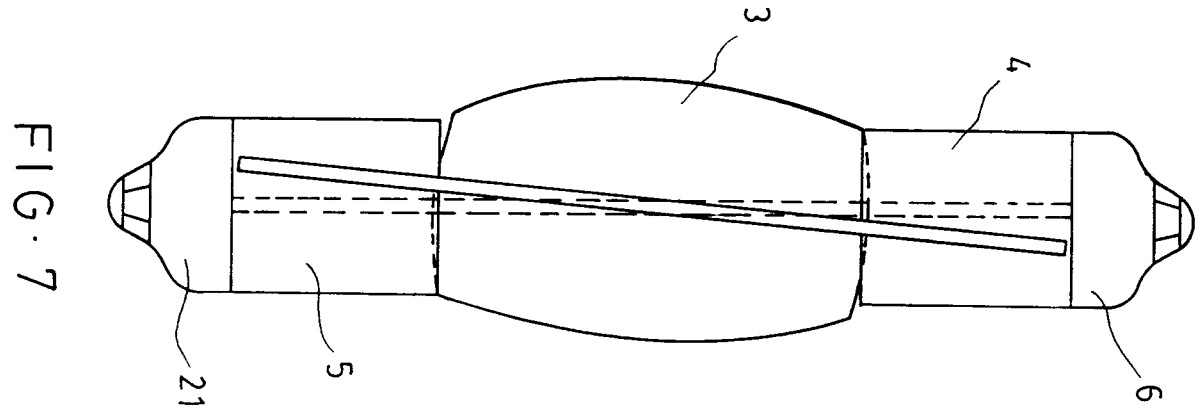
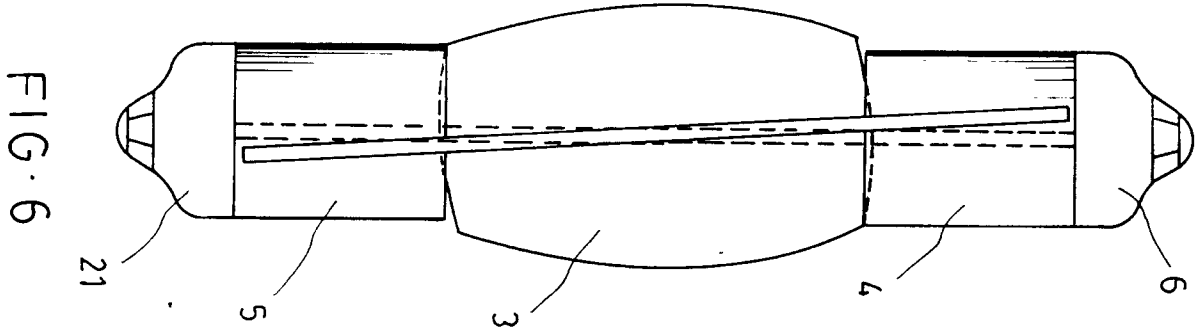


FIG. 5



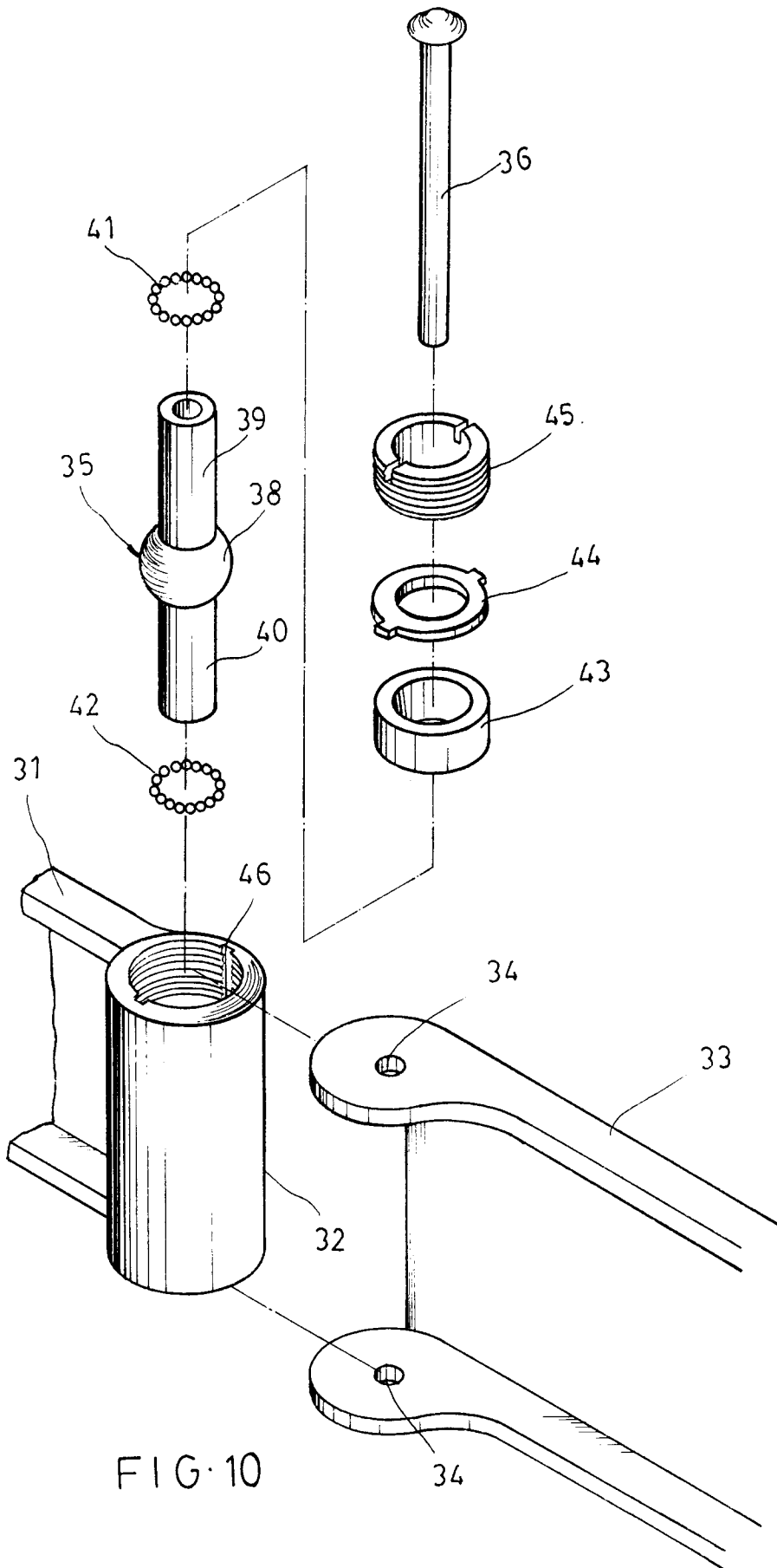


FIG. 10